Arizona Prosecuting Attorneys' Advisory Council

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DAUBERT HEARING SCRIPT FOR LATENT PRINTS

Direct Testimony

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Daubert Hearing Script for Latent Prints – Direct Testimony

DISCLAIMER: The answers given in italics below may not be word for word during actual testimony, but are provided to give a general idea of what the witness will discuss. Exhibit numbers refer to associated Powerpoint presentation.

EXPERT QUALIFICATIONS

State your name for the record.

Name

Where are you employed and what is your job title?

Arizona Department of Public Safety, Regional Crime Lab. Criminalist in the Latent Print Unit/Latent Print Examiner.

What are your duties at the crime lab in the latent print unit?

Process evidence for latent prints, compare latent prints to known print exemplars, search latent prints in the AZAFIS database

What is your training and experience?

Extensive training program under senior criminalists/examiners covering latent print processing and comparison. Proficiency testing in both processing and comparisons prior to case work. Outside courses/classes.

As part of your job, do you stay up to date with publications in the field? How?

Receive and read monthly journals as member of IAI. Biweekly article reviews.

Are you a member of any professional associations? Which ones?

Yes. List of associations (i.e. IAI, AIC, etc.)

Have you testified as an expert witness before? How many times?

Yes/no, depending on witness.

Today's testimony will be focusing on the scientific basis of friction ridge analysis and its general acceptance, testing and peer review of the theory and technique of friction ridge analysis, potential rate of error, and standards and quality assurance. Are these all areas that are part of your training and experience?

Yes.

INTRODUCTORY INFORMATION

What is friction ridge skin?

Skin found on the palmar surface of the hands and the soles of the feet that contains friction ridges. ***(Exhibits 1-6)***

Can friction ridge skin arrangements be recorded?

Yes.

Is there a standard way of recording known prints? What is it?

Yes. Inked fingerprint cards or livescan fingerprint cards under controlled circumstances. ***(Exhibits 7-10)***

How are recordings of friction ridge skin utilized?

Latent print comparison, victim identification, hospitals, biometric devices, personal identification, employment/licensure ***(Exhibit 11-13)***

What is a latent print?

An unintentional recording of friction ridge skin that is not visible to the eye. ***(Exhibit 14)***

What information does an examiner use to conduct a comparison?

Level 1 detail – ridge flow (pattern, orientation), level 2 detail – ridge path (Galton details), level 3 detail – ridge shape (pores, edge shapes) ***(Exhibits 15-27)***

What are the basic factors that allow friction ridge impressions to be used as a reliable means of identification?

Persistence of friction ridge skin – barring permanent scarring or injury, same arrangement of ridges remains throughout life

Uniqueness of friction ridge skin – formed by a combination of genetic, environmental, and random growth factors ***(Exhibit 28)***

THEORY OF FRICTION RIDGE ANALYSIS

Why are friction ridge arrangements persistent?

Due to dermal/epidermal attachments and cell-to-cell attachments. As dead skin cells slough off, new skin cells are generated in the basal layer to replace them and maintain skin at the correct thickness.

Discuss:

Layers of skin

Primary and secondary ridges

Cell-to-cell attachments and cellular communication ***(Exhibits 29-33)***

Is there any empirical data to support the premise that friction ridge arrangements are persistent?

Yes, research dates back to the early 1900s

Discuss:

Herschel research

Faulds research ***(Exhibits 34-36)***

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Why is friction ridge skin unique?

Due to genetic factors inherited from parents and other environmental/random factors during friction ridge formation in the womb – the combination of factors eliminates the potential for duplication, making friction ridge arrangements unique to each individual

Discuss:

Development timeline of friction ridge skin in utero

Order of friction ridge formation (volar pads, primary ridges, secondary ridges, visible friction ridges)

Volar pads

Growth tensions which lead to minutiae ***(Exhibits 37-46)***

Is there any empirical data to support the premise that friction ridge arrangements are unique?

Yes, research dates back to the late 1600s (history from Malpighi, 1687, to Ashbaugh, 1999) ***(Exhibit 47)***

Do identical twins have unique friction ridge arrangements?

Yes. Twin studies have been conducted showing no duplication. (i.e. Lin's study with 3920 fingers of twins) ***(Exhibit 48)***

What are the different factors that may affect the appearance of a friction ridge impression?

Substrate (surface), matrix (material on friction ridges, such as sweat or oil), development medium (substance used to make the latent print visible), pliability of friction ridge skin, deposition of print (pressure, movement, etc) ***(Exhibits 49-54)***

Are the concepts of persistence and uniqueness generally accepted by the scientific community?

Yes.

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TECHNIQUE OF FRICTION RIDGE ANALYSIS

Is there a minimum number of characteristics that must be present in order to identify a latent print? Why not?

No. No scientific basis exists requiring a minimum number (numerous studies). In addition, the totality of the print is considered by the examiner (all three levels of detail previously mentioned, clarity of print, etc) so that simply counting characteristics would leave out critical supporting evidence.

Discuss:

1973 IAI resolution

1995 Ne'urim Declaration

1995 Evett and Williams (16 point review)

2003 SWGFAST statement ***(Exhibits 55-58)***

What methodology is used for print comparisons?

The ACE-V method.

What is ACE-V?

Much like the scientific method, it is a step-by step methodology for reaching a conclusion. It stands for Analysis (determining the quality and quantity of information present in both the latent prints and the known prints to determine if a comparison is possible), Comparison (the side-by-side comparison of all levels of detail in the latent and known prints), Evaluation (the conclusion drawn from the comparison) and Verification (the same process repeated by a second examiner to check the conclusion reached by the first). ***(Exhibit 59)***

How is ACE-V applied to a print comparison?

Walk though steps in a typical comparison ***(Exhibits 60-73)***

Is the step-by-step methodology to reach a conclusion used in the ACE-V method generally accepted by the scientific community?

Yes

What statistical models have been used to determine uniqueness?

Numerous studies dating back to the late 1800s. (history from Galton, 1892, to Srihari, 2007) All support uniqueness but none, to date, are adequate for pinpointing a threshold (i.e. minimum amount of information) needed in a latent print to establish uniqueness. Inadequacy of models comes from:

- *basing models solely on ridge event*
- *ignoring ridge flow*
- *not addressing all levels of detail in the print*
- *not adequately accounting for the clarity of a print.* ***(Exhibits 74-75)***

Studies are ongoing to determine the feasibility of statistical modeling in latent print examination (Langenberg, Neumann, Champod et al)

ERROR RATE

Has any testing been done to determine the reliability of examiners conducting friction ridge comparisons?

Yes, several studies starting in the 1990s have examined this area, and while all demonstrate examiner reliability, none of the studies have been adequate for establishing a predictive error rate for the science of latent print comparisons.

Discuss:

Evett and Williams, 1995

Wertheim, Langenberg, and Moenssens, 2006

Langenberg, Champod, and Wertheim, 2008

Langenberg, 2009 ***(Exhibit 76)***

Is there an error rate for friction ridge comparisons? Why not?

No, a predictive rate of error in a latent print examination does not currently exist. There are numerous factors involved in determining a latent print error rate (i.e. no instrumentation used with a measurable accuracy limit, quality of prints being compared, training of examiner, types of errors such as administrative vs. technical errors, etc). While a past error history could be established, it has no value for predicting a future error or, particularly, an error in an individual case. Studies are currently being conducted to determine the feasibility of calculating any sort of useful error rate in friction ridge analysis (Mnookin study, UCLA, underway). ***(Exhibits 77-83)***

Are there procedures that are used in friction ridge analysis that address the possibility of error in a particular case?

Yes, our lab has extensive quality assurance procedures in place to minimize the possibility of any error in a case.

STANDARDS/QUALITY ASSURANCE

What measures are in place at your crime lab to ensure quality?

- *Extensive training program requiring ongoing proficiency testing in both processing and comparisons before an examiner is allowed to work on casework without direct supervision.*
- *Yearly proficiency testing from a third-party source.*
- *ASCLD/ISO lab accreditation.*
- *Internal audits.*
- *Established standard operating procedures, including casework documentation, conflict resolution and disciplinary policies.*
- *Ongoing training and education.*
- *Independent review and verification of all identification or exclusion decisions by a second examiner.*
- *Technical and administrative review of all casework.*
- *Latent print peer group.* ***(Exhibits 84-88)***

The NAS report addressed a number of issues in the field of forensic science. How is your lab addressing these issues and criticisms?

See above, as well as participation in research projects in the field and attendance at conferences to remain current in industry standards.

SUMMARY

Based on all of your testimony today, what is your opinion regarding the use of friction ridge impressions as a reliable means of identification?

- *The underlying premise of persistence and uniqueness of friction ridge arrangements has been studied, peer reviewed, and generally accepted by the scientific community and the courts.*
- *ACE-V methodology has been studied, tested, peer reviewed, and generally accepted by the scientific community.*
- *A predictive error rate would be very difficult to calculate for friction ridge analysis, but research to date supports the reliability of examiners conducting friction ridge analysis.*
- *Our quality assurance program ensures that the chance of error in any individual case is extremely remote.*